

Sample Examination Two

Section I

Time—1 hour and 30 minutes

Questions 1–40

Percent of total grade—50

Directions: The questions or incomplete statements that follow are each followed by five suggested answers or completions. Choose the response that best answers the question or completes the statement.

1. Creating a sample of students by starting with the second name in the student directory and selecting every 15th name best describes

(A) random sampling
(B) cluster sampling
(C) stratified sampling
(D) systematic sampling
(E) convenience sampling

Answer

2. A random sample of size 16 is to be taken from a normal population having mean 100 and variance 4. What is the 90th percentile of the distribution of \bar{x} ?

(A) 97.44
(B) 100.08
(C) 100.32
(D) 100.64
(E) 102.56

Answer

3. In each of the following, the p -value and significance level α are given for a test of hypothesis. Which pair of values warrants a rejection of the null hypothesis?

- (A) p -value = 0.0312, $\alpha = 0.01$
- (B) p -value = 0.0411, $\alpha = 0.05$
- (C) p -value = 0.0529, $\alpha = 0.05$
- (D) p -value = 0.0674, $\alpha = 0.05$
- (E) p -value = 0.1328, $\alpha = 0.10$

Answer

4. Suppose A and B are events with the given probabilities: $P(A) = 0.62$, $P(B) = 0.44$ and $P(A \text{ and } B) = 0.31$. Which of the following conclusions can be drawn from the data?

- (A) $P(A \text{ or } B) = 0.75$
- (B) A and B are mutually exclusive events.
- (C) A and B are independent events.
- (D) $P(A|B)$ cannot be determined from the given information.
- (E) $P(B|A)$ cannot be determined from the given information.

Answer

5. Failing to reject a null hypothesis that is false can be characterized as

- (A) a Type I error
- (B) a Type II error
- (C) both a Type I and Type II error
- (D) a standard error of the mean
- (E) no error

Answer

6. If a 95% confidence interval is given by (86.52, 89.48), which of the following could be a 99% confidence interval for the same data?

- I. (86.98, 89.02)
- II. (86.37, 89.63)
- III. (87, 89)

- (A) I only
- (B) II only
- (C) III only
- (D) I and III
- (E) II and III

Answer

7. Which of the following represents a probability density function?

- (A) $f(x) = \begin{cases} 0.6 & \text{for } 2 < x < 4 \\ 0 & \text{elsewhere} \end{cases}$
- (B) $f(x) = \begin{cases} 0.2 & \text{for } 0 \leq x \leq 2 \\ 0.3 & \text{for } 2 < x \leq 4 \\ 0 & \text{elsewhere} \end{cases}$
- (C) $f(x) = \begin{cases} 0.1 & \text{for } 0 \leq x \leq 5 \\ 0.2 & \text{for } 5 < x \leq 10 \\ 0 & \text{elsewhere} \end{cases}$
- (D) $f(x) = \begin{cases} 0.5 & \text{for } 0 \leq x \leq 20 \\ 0 & \text{elsewhere} \end{cases}$

- (E) None of the above

8. Maritsa scored 82 on a geometry exam for which the class mean was 74 and the standard deviation 3.2 and she scored 86 on a biology exam for which the class mean was 77 with a standard deviation of 2.9. In comparison to other members of each of these classes, which of the following conclusions can you draw?
- (A) Her performance on the geometry exam was better than her performance on the biology exam.
 - (B) Her performance on the biology exam was better than her performance on the geometry exam.
 - (C) Her relative performance was the same for both exams.
 - (D) Her relative performance was graded unfairly.
 - (E) No conclusion can be drawn from this data.

Answer

9. Assuming that birthdays are uniformly distributed throughout the week, the probability that two strangers passing each other on the street were both born on Sunday is
- (A) $1/7$
 - (B) $2/7$
 - (C) $1/49$
 - (D) $2/49$
 - (E) $4/49$

Answer

10. Which of the following are characteristics of a t -distribution curve?
- I. The graph of a t -distribution extends infinitely to the left and to the right and approaches the x -axis asymptotically as x increases in absolute value.
 - II. There are an infinite number of different t -curves, each determined by a parameter called degrees of freedom.
 - III. The maximum point on the graph of a t -distribution occurs at its mean which is always 0.
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I and III only
 - (E) I, II, and III

Answer

11. A teacher raised each student's grade by 10 points on an algebra exam. Which of the following describes the correlation between students' original grades and their adjusted grades?

(A) slightly negative
(B) slightly positive
(C) close to 0
(D) -1
(E) 1

Answer

12. In conducting a hypothesis test, the p -value is the

(A) probability of obtaining a result as extreme or more extreme than the one obtained if the null hypothesis is true
(B) significance level of the test
(C) probability of making a Type I error
(D) probability of making a Type II error
(E) probability that the null hypothesis is true

Answer

13. In constructing a confidence interval based on a large sample to estimate the mean μ of a population with a known standard deviation σ , which of the following does NOT affect the width of the confidence interval?

(A) the sample mean
(B) the population standard deviation
(C) the confidence level
(D) the sample size
(E) the sample standard deviation

Answer

14. Which of the following are conditions for a binomial experiment?

- I. The number of trials n is a fixed number.
- II. The n trials are independent.
- III. The probability of success p is equal to the probability of failure q .

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III

Answer

15. Which of the following is NOT true concerning sampling distributions?

- (A) If the sample size n is large, the sampling distribution of \bar{x} , drawn from a normal population, is approximately normal.
- (B) The mean of the sampling distribution of \hat{p} is equal to the population proportion p .
- (C) The mean of the sampling distribution of the difference of two means $(\bar{x}_1 - \bar{x}_2)$ is equal to the difference of the population means $(\mu_1 - \mu_2)$.
- (D) The standard deviation of the sampling distribution of \bar{x} is σ/\sqrt{n} , where σ is the population standard deviation.
- (E) The standard deviation of the sampling distribution of the differences of two means $\sigma_{\bar{x}_1 - \bar{x}_2}$ is equal to the sum of the respective population standard deviations.

Answer

16. The all-time leader in career batting average among major league baseball players is Ty Cobb with a career average of 0.366. This means he got a hit in 36.6% of his official at-bats. What was Cobb's probability of getting at least one hit in four official at-bats?

(A) 0.092
(B) 0.134
(C) 0.162
(D) 0.366
(E) 0.838

Answer

17. Which of the following accurately describes the power of a statistical test of hypothesis?

(A) It is equal to the p -value.
(B) It is equal to $1 - (p\text{-value})$.
(C) It is equal to α , the significance level.
(D) It is the probability that a test using a fixed value of α will reject H_0 when a particular alternative value of the parameter is true.
(E) It is equal to β .

Answer

18. The equation of the least squares regression line for a set of points in a scatterplot is given by $\hat{y} = 2.2 + 0.81x$. The point (5, 7) is one point on this scatterplot. Which of the following is the residual for the point (5, 7)?

(A) 0.71
(B) 0.75
(C) 4.05
(D) 6.25
(E) 7.87

Answer

19. The table below shows the probability distribution for the number of tails (X) in five tosses of a fair coin. What is $E(X)$, the expected value of X ?

X	0	1	2	3	4	5
$P(X)$.03125	.15625	.3125	.3125	.15625	.03125

- (A) 2.0
(B) 2.5
(C) 3.0
(D) 3.5
(E) 4.0

Answer

20. Which of the following statements is a consequence of the Central Limit Theorem?

- I. If the original population is uniformly distributed, then the sampling distribution of \bar{x} will be uniform for large samples.
II. The sampling distribution of \bar{x} will be approximately normal for large samples.
III. The mean of the sampling distribution of \bar{x} will be close to μ for large samples.

- (A) I only
(B) II only
(C) III only
(D) II and III only
(E) I, II, and III

Answer

21. The probability of a tourist visiting an area cave is 0.70 and of a tourist visiting a nearby park is 0.60. The probability of visiting both places on the same day is 0.40. The probability that a tourist visits at least one of these two places is

- (A) 0.08
(B) 0.28
(C) 0.42
(D) 0.90
(E) 0.95

Answer

22. The correlation between height and weight among men between the ages of 18 and 70 in the United States is approximately 0.42. Which of the following conclusions does NOT follow from the data?
- (A) Taller men tend to be heavier.
 - (B) Changing the units of weight and height would still yield the same correlation value.
 - (C) Heavier men tend to be taller.
 - (D) If a man in this group changes his diet and gains 10 pounds, he is likely to get taller.
 - (E) There is a moderate association between a man's height and weight.

Answer

23. A high school guidance counselor wishes to compare the PSAT results for the male and female students in the junior class at your high school. Which is the best technique for gathering the data needed?
- (A) census
 - (B) experiment
 - (C) observational study
 - (D) sample survey
 - (E) a double blind experiment

Answer

24. The stem plot below summarizes the number of gold medals earned by 40 countries in the Winter Olympics for 1924–1998.

0	8279902011100110110001000
1	988
2	9571
3	9895
4	3
5	9
6	1
7	8
8	8

The data depicts a distribution that is

- (A) skewed to the left
- (B) skewed to the right
- (C) symmetric
- (D) uniform
- (E) not determinable from the information given

Answer

25. A tire manufacturer claims that it has developed a new all-season radial tire for passenger cars (excluding SUVs) which has a shorter skid distance than the known mean skid distance, 140 feet, for all tires currently available. A consumer group wishes to test this claim. If μ represents the true mean skid distance for this new tire, which of the following states the null hypothesis and alternative hypothesis that the consumer group should test?

- | | |
|-----------------------------|-------------------------|
| (A) $H_o: \mu < 140$ ft. | $H_a: \mu \geq 140$ ft. |
| (B) $H_o: \mu \leq 140$ ft. | $H_a: \mu > 140$ ft. |
| (C) $H_o: \mu = 140$ ft. | $H_a: \mu < 140$ ft. |
| (D) $H_o: \mu = 140$ ft. | $H_a: \mu \leq 140$ ft. |
| (E) $H_o: \mu = 140$ ft. | $H_a: \mu \neq 140$ ft. |

Answer

26. Suppose that A and B are events in a sample space with $P(A) = 0.8$ and $P(B|A) = 0.5$. Then $P(A \text{ and } B) =$

(A) 0.3
(B) 0.4
(C) 0.625
(D) 0.8
(E) 1

Answer

27. A telephone survey of 1000 adult Americans reveals the following data concerning the President's tax cut plan

	Support	Oppose	Undecided
Male	300	180	90
Female	210	190	30

Suppose a study is conducted to test the association between gender and position on the tax cut plan. What is the expected number in the cell representing females who support the tax cut plan?

(A) 210
(B) 215
(C) 219.3
(D) 240.3
(E) Not enough information given

Answer

28. Two independent random samples of size $n_1 = 45$ and $n_2 = 38$, with respective standard deviations $\sigma_1 = 2.3$ and $\sigma_2 = 1.8$, are drawn from two normally distributed populations. Which of the following represents an estimate of the standard deviation of the sampling distribution corresponding to $\bar{x}_1 - \bar{x}_2$?
- (A) 0.25
(B) 0.31
(C) 0.45
(D) 0.50
(E) 2.05

Answer

29. SRS refers to a simple random sample. Suppose an SRS of size n is drawn from a population. Which of the following accurately characterizes this sample?
- I. It is a sample drawn in such a manner so that every set of n subjects in the population has an equal chance to be the sample chosen.
II. It is a sample drawn in such a manner so that every subject has some chance of being chosen.
III. It is a sample drawn in such a manner that every subject in the population has an equal chance of being selected.
- (A) I only
(B) II only
(C) III only
(D) II and III only
(E) I, II, and III

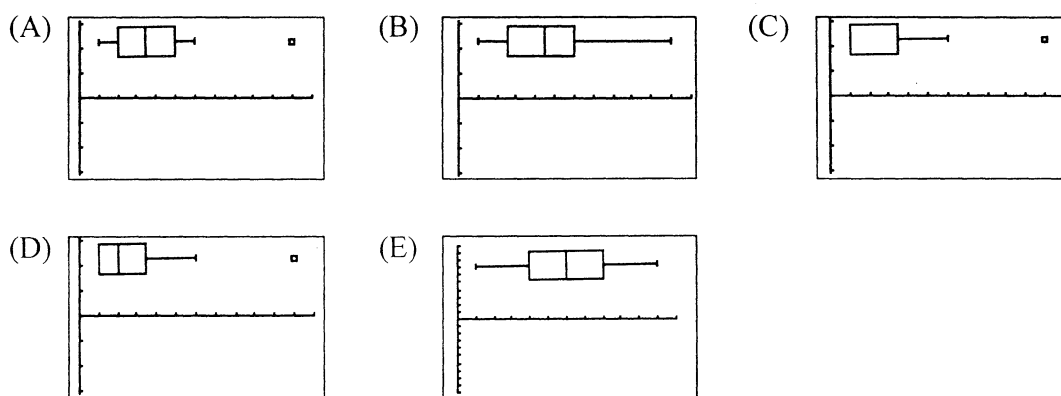
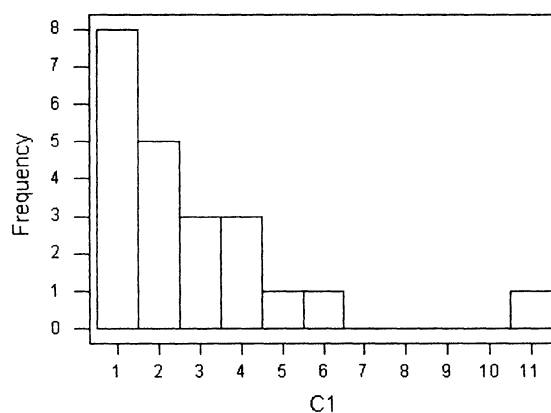
Answer

30. The points (x, y) on a scatterplot form an ellipse. As the ellipse becomes thinner, what can be concluded about the correlation r between the variables x and y ?

(A) r decreases in absolute value
(B) r increases in absolute value
(C) r remains constant
(D) the value of r changes sign
(E) no conclusion can be drawn

Answer

31. The histogram below displays a set of measurements. Which of the boxplots below displays the same set of measurements?



Answer

32. The correlation r between the magnitude of an earthquake and the depth below the surface of the earth at which the quake occurs has been determined experimentally to be about 0.51. Suppose we use the magnitude of the earthquake (x) to predict the depth below the surface (y) at which the quake occurs. We can infer that
- (A) the least squares regression line of y on x has slope equal to 0.51
 - (B) the fraction of the variation in depths explained by the least squares regression line of y on x is 0.26
 - (C) about 51% of the time, the magnitude of an earthquake will accurately predict the depth at which the earthquake occurs
 - (D) the numerical value of the depth is usually 51% of the numerical value of the earthquake
 - (E) twenty-six percent of the data values lie on the least squares regression line

Answer

33. A report from the Maine Department of Inland Fisheries and Wildlife indicates that there occurs on average one fatality per 100 collisions between cars and deer. In 300 collisions between a car and a deer, what is the expected number of fatalities and the standard deviation?
- (A) mean = 0.33 standard deviation = 0.01
 - (B) mean = 1 standard deviation = 0.01
 - (C) mean = 3 standard deviation = 1.72
 - (D) mean = 3 standard deviation = 2.97
 - (E) mean = 30 standard deviation = 3.0

Answer

34. Johannes Kepler (1571–1630) was able to show that the square of the period of revolution of a planet is proportional to the cube of its mean distance from the sun. The equation $y = 0.001118x^{1.5}$, where x is the distance of a planet from the sun (in millions of miles) and y is the period of revolution (in years) of a planet around the sun, is a power regression model which represents this relationship. Which of the following will produce a linear representation of this model?

(A) plotting y versus $\ln x$
(B) plotting x versus $\ln x$
(C) plotting x versus $\ln y$
(D) plotting $\ln x$ versus $\ln y$
(E) constructing the residual plot for the scatterplot of y vs. x

Answer

35. Which of the following is an appropriate graph to display univariate categorical data?

(A) stemplot
(B) histogram
(C) boxplot
(D) pie chart
(E) scatterplot

Answer

36. A large university is considering introducing a new major in Economic Geography and wishes to poll the current student body for their opinion of the feasibility of introducing such a major. The Office of Public Relations mails a questionnaire on this issue to a SRS of 2000 students currently enrolled in the university. Of the 2000 questionnaires mailed, 532 have been returned of which 219 students support the new major. Which of the following represents the population for this study?

(A) the 2000 students receiving the questionnaire
(B) the 532 students who responded
(C) the 219 students who support the new major
(D) the 2000 students selected represent a sample of the population of all currently enrolled students
(E) all students who are currently enrolled and all past alumni of the university

Answer

37. A Physicians' Study Group wishes to design a matched pairs test to determine the effects of a medication on reducing the elevated cholesterol levels in 200 adults in the 35–65 age group. Which of the following represents such a design?
- (A) The Physicians' Group compares cholesterol levels of each patient before he/she begins a daily regimen of the medicine to the patient's cholesterol level after six weeks of using the medication.
 - (B) The Physicians' Group compares the cholesterol levels of the patients using the medicine for six weeks with the cholesterol levels of 200 adults in the same age group who exhibited elevated cholesterol levels and did not take the medicine.
 - (C) The Physicians' Group compared the mean cholesterol level of the 200 patients six weeks after using the medicine with a published national mean cholesterol level for all adults in this age group.
 - (D) The Physician's group compares cholesterol levels of the 200 patients using the medicine for six weeks with the cholesterol levels of 200 adults in the same age group who were taking a placebo.
 - (E) All of the above are representative of a matched pairs design.

Answer

38. Let X represent the number of independent rolls of a fair die required to obtain the first "2". What is $P(X = 5)$?
- (A) $(1/6)^4(5/6)$
 - (B) $(1/6)^4$
 - (C) $(5/6)^4(1/6)$
 - (D) $(5/6)^5$
 - (E) $(5.6)^4$

Answer

39. A local university has a “drop-in center” located near the Student Union where students can “drop-in” to speak to a counselor on any issue or concern whether personal or academic. A researcher stations herself at a receptionist’s desk during a few random evenings to collect data on whether men or women are more likely to use this service and whether a particular class (freshman, sophomore, junior, senior) is more likely to “drop-in.” This study may be described as a
- (A) controlled experiment
 - (B) matched pairs design
 - (C) census
 - (D) observational study
 - (E) a double blind completely randomized experiment

Answer

40. A researcher wishes to use a 95% confidence interval to estimate the proportion of Americans who have visited an entertainment theme park near Orlando within the last five years. The researcher wishes to choose a size that will insure a margin of error not to exceed 0.05. Which of the following is the smallest size that meets these criteria?
- (A) 40
 - (B) 200
 - (C) 400
 - (D) 600
 - (E) 800

Answer